Sally 904-353-5051

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How to Use this Manual

The ***Sally Operating and Maintenance Manual*** was written to assist our clients in understanding how our audio animated characters and productions function. While the subject matter is technical, every effort has been made to make this manual easily understood and useful.

This guide is divided into three primary sections—Operations, Installation and Maintenance.

In the *Appendix* you will find important information specifically about the equipment you purchased. This information was prepared for you during manufacturing.

If you have questions not covered in this manual or if you find the information unclear, we encourage you to call our ***Customer Service Department.***

Craig Rodrigo
904-353-3787

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Rev. 91-1-H

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What Makes Robots Run

Breathing life into a Sally robotic character may seem technically complicated. In reality simple principles and techniques involving compressed air, an audio system and a computer are what make robots run.

The Air System

The air used to power the animated character is produced by an air compressor which is an integral part of the animatronic package. The air system often includes devices to filter, regulate and dry the air before it does its work.

Air power is referred to as *pneumatics*.

The pressurized air is brought to the character through an air hose where it is dispatched through valves to the appropriate cylinders or actuators. The air pressure forces the cylinder shaft to move outward or inward. The shaft is attached to mechanisms to create the animated movement, e.g., eyes, mouth, arms, etc.

The Audio System

The air system gets its instructions as to which valve to activate and which cylinder shaft to move from a prerecorded audio source. Often this source of audio is a multi-track tape recorder, however, it may also be a compact disc (CD), laser video disk (LVD) or a computer chip memory (digital sound).

The audio source also stores and plays back the sound track of the character in synchronization with the animation instructions (control data).

Using a multi-track tape recorder as an example, on one track is recorded control data in the form of audio impulses that command the air valves in the character and switches relays to turn on an off on cue certain special effects and the audio source. On a parallel audio track or tracks, and in exact synchronization, is the character's sound track such as narration or singing, stereo music and sound effects.

The same principle applies to the use of CDs and digital audio storage devices which have the equivalent of side-by-side "tracks" or audio channels that are in synchronization with each other.

The sound track channels are fed directly to audio amplifiers and speakers. But the animation control data channel is fed directly to the *Animation Control System* for interpretation.

Animation Control System

The *Animation Control System* (ACS) is a computer that serves primarily as an electronic decoder interpreting the control data or instructions coming from the prerecorded audio source. As the data flows into the ACS this computer interprets which valve should be switched on or

off. The term "switch" is appropriate. The ACS turns on the valve for a specified length of time to allow air to flow to the cylinder which in turn creates the movement. Sometimes, however, the computer switches on or off a relay which in turn controls lighting, motors or other effects that usually require stronger electrical currents to operate.

The ACS can also be programmed to start the animated character or production at a certain time, control the audio source and perform a variety of other show control functions.

The ACS has other features which may include editing, voice-activation and timing among others.

Summary

Making a robot talk or move is a matter of instructing compressed air which cylinders to turn on and off and when they should make their move. Those instructions are usually prerecorded along with the robot's sound track on tape or stored in some other audio source. When the audio source is initiated, the commands to control the air flow are received by the Animation Control Computer which activates the valves to let air flow to the cylinders. See Figure I-1.

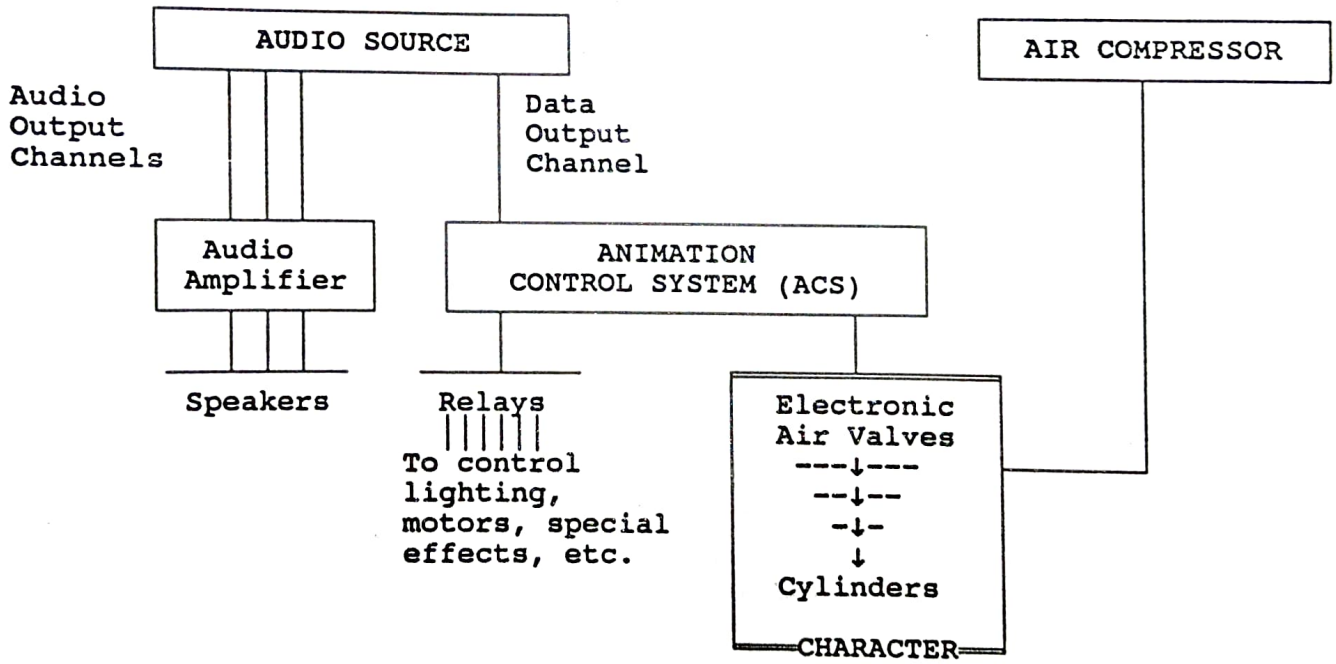

Fig. I-1
Block Diagram of Animated Character Control

Section II
Operating Instructions

The Air System

Why Compressed Air? For a number of reasons, compressed air is the most commonly used source of power for animation. Air is free. Air is clean. Air-activated cylinders are small and compact. Pneumatic (air) components are readily available worldwide. Electrical codes generally do not apply because conduit is not usually needed. There is no danger of electrical shock. Pneumatic operation is easy to understand. Most importantly, it is reliable.

AIR COMPRESSOR

Depending on your system, an air compressor of a specific size are included in the basic package of equipment needed to operate an animated show. The air compressors are specified according to the required horsepower and capacity required to provide the proper level of air pressure and volume needed to power the character and other special equipment.

Often an attached or adjacent air storage tank is part of the system. The tank holds a ready reserve of pressurized air. The compressor automatically keeps the tank charged with enough air to maintain the proper pressure and volume.

√ For detailed information about the compressor and tank supplied with your system, refer to the *Appendix* of this manual.

IMPORTANT NOTE: Because the air compressor uses an induction motor, it is important that the compressor be assigned to an electrical circuit separate from the one used for the Animation Control System and audio equipment.

DRYER

Some air systems require a device to dry the air. Moist or damp air causes rust and clogging of the delicate valves and cylinders. It is important that the air being sent to the animated characters remain filtered and clean as well as free of moisture.

√ For detailed information about the dryer supplied (if any) with your system, refer to the *Appendix* of this manual.

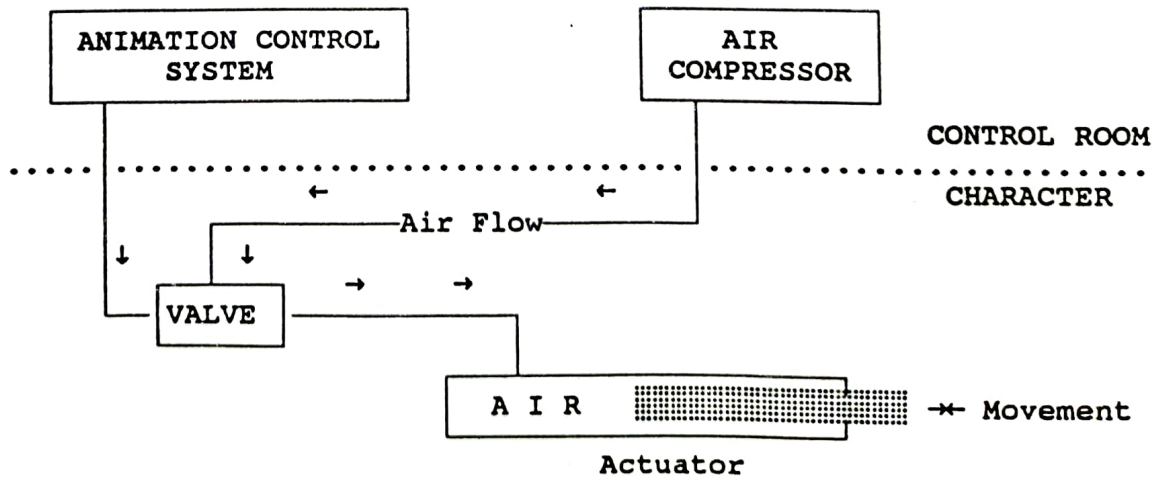

Figure II-1 Block Diagram of Basic Air System

ELECTRONICALLY-ACTIVATED AIR VALVES

A most important link in the pneumatic system is the electronically-activated air valve. The valve receives an electrical signal from the ACS and releases and directs the pressurized air to do work. The pressurized air passes through an air tube to an *actuator* (generally a cylinder) and creates the mechanical movement. When the signal to the valve is deactivated (released), the air exhausts back through the valve.

The workhorse of your animation system is the EVO valve. This type of valve is used by many different industries including textiles, photo-processing and automated manufacturing. Almost every movement in your system is controlled either directly or indirectly by such a valve.

Usually the valve is powered by 24 volts dc, however, some older valves may operate at 12 volts dc. This system is depicted in Figure II-1.

▪ VALVE BOARDS

For ease of installation, wiring and labeling, the valves are mounted in a group on a printed circuit board. The boards may include from one to seven separate valves per board, depending on the number of movements required.

Each valve has a corresponding LED mounted on the board to aid in troubleshooting. When the valve receives an *on* signal, the LED illuminates.

The valves are attached to the board via an air manifold which provides a common air source for all valves on the board. The electrical connections on the valves are soldered to the printed circuit board. The board is connected to the ACS via a single eight-conductor cable with a quick-disconnect electrical Panduit connector. When fully assembled, the board, valves and electrical connections are referred to as a *valve board.*

▪ COLOR CODING

Color coding is an important part of the valve board and air system. The eight-conductor cable from the ACS that attaches to the valve board is functionally color coded. Likewise, the output air hoses from the valves to the cylinders are color coded in the same manner.

Every valve board is labeled with an index to identify which movement is assigned to a specific valve.

FLOW CONTROLS

When an electrical signal is sent from the ACS, the valve opens and a large quantity of air flows into the cylinder chamber. In almost all cases, this quantity of air would be too large and must be restricted by a flow control device. Between each valve and cylinder is a small, fixed volume flow control mounted in series with the air tube.

These flow devices control the speed of the air movement. The larger the opening, the faster the movement. The flow controls have been set at our factory, and should not usually require adjustment. However, if you desire a speed change, please advise us and we will be happy to provide a different flow restrictor.

PRESSURE/REGULATORS

Another important part of the pneumatic system is air pressure. Pressure is the *force* of the air. Air is pressurized by a compressor and usually stored in a tank. The pressurized air is regulated both at the compressor and at the animation. The regulator on the compressor should initially be set at about 110-120 psi (pounds per square inch). If the distance between the compressor and the animation is significant, higher pressures may be required to overcome the drop in pressure in the long air lines.

At the character, the main air line from the compressor is split into two or more air lines, each individually regulated.

- **HIGH PRESSURE LINE (white)**

The *white* air line is regulated to about 90 psi and is routed to the valve boards. This line is referred to as the *high pressure line*. The high pressure line provides the source of power for the primary movement when activated by the valve.

- **BACK PRESSURE LINE (gray)**

The *gray* lines provide low pressure to the cylinders and are referred to as the *back pressure* lines. Back pressure is usually regulated to about 45 psi. If there were no outside forces acting upon the animation, only one back pressure line would be needed. However, an arm movement requires less applied force to move downward than upward because of gravity. In this instance, the downward back pressure needs to be reduced to produce a movement of the same force as the upward movement. This back pressure might be adjusted to about 30 psi.

Movements requiring similar back pressures are grouped together on a single regulator. Each character may have three or four regulators for different levels of back pressures. Since all high pressures are relatively constant, only one regulator is generally required.

NOISE REDUCTION

In some cases it is necessary for the audio system to include a device that reduces or filters out certain distracting noises produce by the surface of audio tape and other sound storage media. This is often referred to a DBX or Dolby noise reduction systems.

√ If a noise reduction device is specified for your show, refer to the *Appendix* of this manual for information about its proper installation and operation.

SPEAKERS

The audio speakers may be large stereo-type speakers capable of filling an entire theater with sound. The audio speakers may also be smaller units strategically placed or concealed adjacent to the animated characters. Often individual speakers are placed inside the animated characters usually in the upper chest area.

Sally Industries, Inc.

ACS-50 Series

Animation Control System

Operating Manual

Rev 91-C

ACS-50 Series Operating Manual

DESCRIPTION OF ACS-50 SERIES

The ACS-50 Series is a specially designed animation control computer. It is both a playback and programming control unit. Depending upon your specific application, your ACS-50 may be configured at the factory to control up to 24 channels or circuits of animated movement, special effects, lighting, curtain motors, or any variety of devices needing to be synchronized with the animatronic production.

In addition, the ACS-50 can either automatically or manually control the operation of the audio equipment such as starting, stopping and rewinding a tape recorder.

The ACS-50 also features a motion sequencer, *AutoVox*--a voice-activated movement control, and a between-show timer. A self-contained 10-watt audio amplifier is included with most units.

Installing The System

ELECTRICAL POWER REQUIREMENTS

The ACS-50 decodes the audio signals from a tape recorder or other audio source. The decoded data is converted into control signals. To perform this task, it is imperative that the ACS has a power supply circuit free from voltage drops and surges caused by other equipment such as the air compressor. For best results, a designated electrical circuit should be used. In any case, the ACS should be on a circuit with minimal loading.

CONTROL OUTPUTS AND INPUTS

Because the ACS can control up to 24 movements or actions, it has 24 signal wiresand at least one common (B+) wire to operate the system. The rear panel of the ACS-50 has three *output* connections for controlling the show and audio equipment. Each of the connectors has fifty contact points. The *Appendix* shows which signal controls each specific movement or action.

The output connections and the signals they control are listed in Table II-1.

Output Number	Signal Control
Control	Tape Recorder Control, Miscellaneous
Output 1	Signals A1-A8, B1-B8, C1-C8
Output 2	Signals A1-A8, B1-B8, C1-C8-10

Table II-1. Output Connector Assignments

In addition to the signal control contacts, there is a series of common (B+) contacts for the system wiring. A detail enlargement of each of the 50-pin connectors and the related outputs is shown in a schematic in the *Appendix.*. The diagram shows the exact location of each signal and common contact point. You will recall that the output power of the contacts is usually 24 volts dc.

Output connectors are directly plugged into the character cables and provide the signal control to the valve boards. Because the two output connections are identical, either character can be connected to either connector. Figure II-1 shows the ACS-50 rear panel layout.

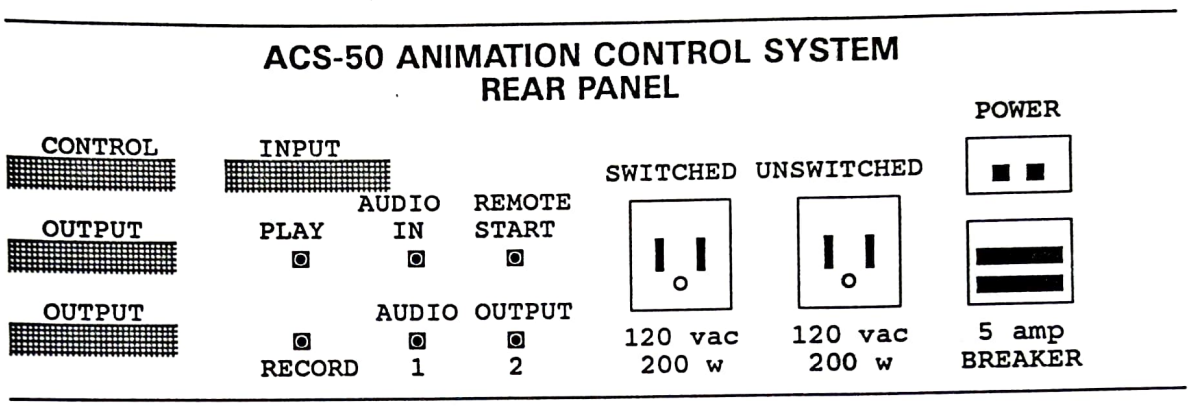

Figure II-1. Rear Panel of ACS-50

INPUT CONNECTOR

The *input* connector on the rear panel of the ACS-50 is for the optional *Remote Programming Console*. The *Remote Programming Console* is a device that enables live show operation from a remote location instead of from the console of the ACS.

PLAY AND RECORD CONNECTORS

Your ACS decodes control information from the data channel of the audio tape. The *input* connector labeled **PLAY** on the rear panel of the ACS-50 is where the ACS receives information. This line should be plugged into the tape recorder channel *output* containing the programmed data.

- **PLAY**

To play a previously recorded program, plug the *output* from the audio source data track into the *play* connector on the back of the ACS-50.

- **RECORD**

Your ACS-50 can record, or input, data onto tape. The output connector labeled *Record* on the rear of the ACS-50 is where the new information is sent to the tape recorder. A cable with a phono jack should be attached from this *output* to the tape recorder *input* to the audio tape track that is to contain the data. When the tape recorder is put into record mode, the data from the ACS is recorded onto the tape.

AUDIO CONNECTORS

The audio connectors are used in conjunction with the ACS ***AutoVox*** feature. ***AutoVox*** allows your character's mouth to move in synchronization with the audio spoken into a microphone during live operation.

The *audio input* connector on the back of the ACS-50 supplies the audio signal to the ***AutoVox*** circuit. It may be fed directly from the tape output or from the speaker output of the amplifier (with less than 10 watts into 8 ohms). You may find one works better than the other.

▪ DUAL FUNCTION

There are two *audio outputs* for use in conjunction with the ***AutoVox***. This permits the *AutoVox* circuit to be used for two characters. One of the outputs should be connected to each character's speaker connection. On the ACS-50 front panel is a button labeled *DUAL FUNC* which, when depressed, switches the audio from output 1 to output 2.

REMOTE START

The remote start input connector (optional) starts the system manually from a distant location. Functionally, the input is the same as the start button on the front panel of the ACS (see discussion on tape control).

ELECTRICAL OUTPUT - UNSWITCHED

The rear panel has a standard female electrical receptacle that can supply power to your tape recorder or other device. This device is operational any time the ACS-50 is plugged in, whether on or off.

ELECTRICAL OUTPUT-SWITCHED

The rear panel also has a standard female electrical receptacle that is only activated when the ACS-50 is operating.

THE ACS-50 KEYBOARD

On the left side of the front panel are three rows of seven buttons referred to as *Program Control* keys. These buttons activate each of the show signals and perform other functions which are discussed later.

On the right side of the panel are three rows of buttons that determine the ACS mode. The buttons function to allow recording, sequencing, automatic mouth control (*AutoVox*), etc.

The two groupings of switches constitute the ACS-50 keyboard as depicted in Figure II-2.

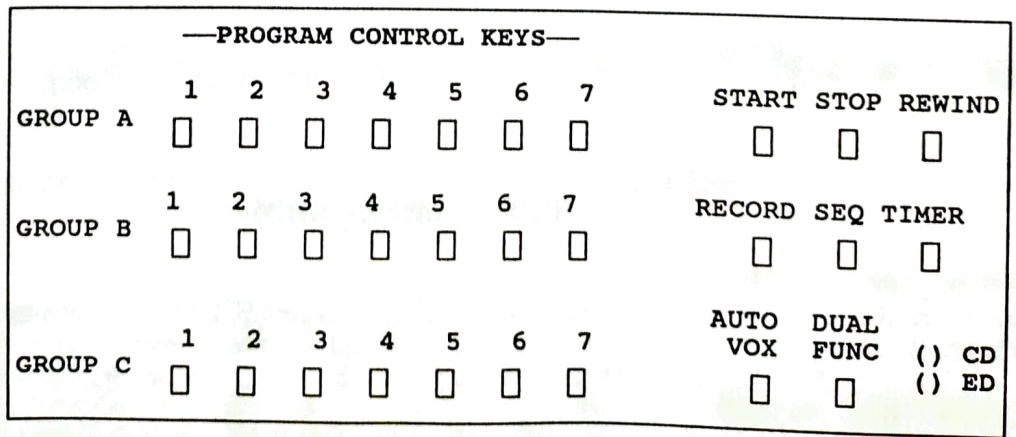

Figure II-2. ACS-50 Keyboard

PLAYBACK OF A PRERECORDED TAPE

The primary function of the *Animation Control System* (ACS) is to decode information from the tape and convert the information into usable outputs. Now that you have installed and verified all of the cable connections to your ACS, you can use the system to play back a prerecorded tape.

To play back a prerecorded tape, turn on the ACS power with the switch on the upper right side of the rear panel. Examine the various buttons on the front panel. A diagram of the front panel is shown Figure II-2.

■ PROCEDURE FOR PLAY BACK

▸ Make sure all of these buttons are OFF, i.e. not lighted.

▸ Place the prerecorded tape in the tape recorder and start the tape recorder. If the ACS-50 has been connected properly, the *CARRIER DETECT* (CD) light will illuminate. This light will illuminate whenever the ACS is receiving information in proper format for decoding from the tape recorder.

▸ If the *ERROR DETECT* (ED) light illuminates, it means the information being received by the ACS is unintelligible and cannot be decoded properly. Check the cable connections on the rear of the ACS and verify that the tape has valid information.

TAPE RECORDER CONTROL

The ACS controls the tape deck during normal system operation. The following is a description of the switches in the manual control section.

STOP will stop the tape deck and the show.
START will start the tape deck and the show.
REWIND will stop the show and put the tape deck in rewind.

TIMER

The *TIMER* sets the length of time from the end of a show to the beginning of the next show. The *TIMER* is activated whenever the button is depressed and the LED indicator on the button is lit. The *TIMER* will begin its countdown when the tape recorder is put into rewind or stopped, and will put the tape into PLAY when the countdown is complete. When programming the *TIMER*, be sure to program enough time to allow the tape to complete its rewind. Otherwise, the tape will begin playing before it rewinds completely.

■ PROGRAMMING THE TIMER

Depress the *TIMER* button until it latches and the LED on the button illuminates. Then depress the *RECORD* button until it latches and the LED on the button activates.

Whenever the *TIMER* and *RECORD* buttons are both activated at the same time, the *Program Control* keys for GROUP A are activated for setting time. Each *Program Control* key corresponds to a period of time as shown in Table II-2.

TABLE II-2. ACS-50 PROGRAM KEY TIMER ASSIGNMENTS

CONTROL KEY	TIME
#1	30 seconds
#2	1 minute
#3	2 minutes
#4	4 minutes
#5	8 minutes
#6	15 minutes
#7	30 minutes

▪ SETTING THE TIMER

To set the time between shows, depress the *Program Control* keys that when added together, equal the amount of desired time between shows. Release the *RECORD* button. The amount of time entered is now set and saved in the ACS.

Example: **To set the timer for 8.5 minutes, simultaneously depress and continue to hold GROUP A *Program Control* Keys #1 (30 seconds) and #5 (8 minutes), and release the *RECORD* button.**

▪ ERASING THE TIMER

To erase or reset the *TIMER*, depress the *REWIND* while the *RECORD* and *TIMER* buttons are depressed.

AutoVox tm

This feature automates the character's mouth in synchronization with an input voice signal. It is used primarily with live show operation, but can also be used while playing a prerecorded tape. When used with a prerecorded tape, it overrides any programmed mouth movement on the tape. The output of the *AutoVox* is fed only to the character and can not be recorded onto tape during new show programming.

▪ PLAYBACK

Depressing the *AutoVox* button automatically activates the *AutoVox* feature in the playback mode. The button latches on and the LED indicator remains illuminated. The *AutoVox* overrides any programmed mouth control on the tape.

▪ LIVE OPERATION

Put a **BLANK** tape into the tape recorder, and depress *PLAY* and *RECORD* buttons on the recorder.

Connect a microphone to the microphone jack on the front of your tape recorder for the appropriate channel of audio that corresponds to the audio input on the rear panel of the ACS-50.

Depress the *AutoVox* button on the front of the ACS-50. Your character's mouth will operate in synchronization with the input voice. You must speak clearly and distinctly. You may need to adjust the record level on the tape deck if the audio from the character is too loud or soft.

▪ DUAL FUNCTION

The *AutoVox* can operate two characters with the *DUAL FUNCTION* button. This button switches the *AutoVox* output from one character to the other. It is useful when operating two characters live.

SEQUENCER

The *SEQUENCER* is a built-in ACS-50 memory feature that causes characters in your show to continue to move in a life-like manner whenever the ACS is not receiving data from the tape recorder. It prevents the characters from going "dead" while the tape recorder is rewinding or stopped.

The *SEQUENCER* memory capability allows activation of any of the control outputs of the ACS for a period of thirty seconds. At the end of this period, the *SEQUENCER* will simply repeat the programmed sequence until it is turned off or the ACS receives data from the tape recorder.

To activate the *SEQUENCER*, depress the *SEQ* button on the front panel of the ACS. The button latches on and the LED will illuminate. When the ACS receives data from the tape recorder, the received signal will override the programmed information on the *SEQUENCER*.

To program the movements of the *SEQUENCER*, see the *Programming The Sequencer* section of this manual.

To restore the sequencer into memory after a power failure, see the *Saving Sequencer Information* section of this manual.

LIVE SHOW OPERATION

In addition to decoding information from the tape recorder to control your show, the ACS encodes information, thus allowing you to operate your show manually. Furthermore, this is helpful in troubleshooting any problem that may arise.

▪ GRID SHEET

Before you can operate the character or show, the movements (or other elements) must be identified in a manner that the ACS can understand. Consequently, a grid system is used to label each control element. Think of this grid as an unique address for each movement or control channel.

The 24 maximum outputs comprise a grid of three *CHANNELS* of eight *BITS* each. Each movement or action in your show is assigned a two-part address code consisting of one channel and one bit. In this manner, each movement is assigned a two bit address that can be understood by the ACS-50. See Table II-3.

		BITS							
		1	2	3	4	5	6	7	8
CHANNELS	A	HEAD NOD							
	B			EYE TURN					
	C						ARM OUT		

Table-3. Sample ACS-50 Grid Map

In the above example, the *Grid Sheet* indicates that the address for the character's head turn movement is Channel *A*, Bit *1*. Also on this matrix you will note that *B3* represents the eye turn movement and *C6* is the address for the character's arm-out motion.

In the *Appendix* your specific show movements are outlined in grid form.

▪ MANUAL CONTROL OF MOVEMENTS

When operating or programming the show, you first must identify the *channel* and *bit* for the desired movements.

On the lower front panel of the ACS-50 are three groups of seven buttons referred to as the *Program Control* keys (see Figure II-3). These buttons correspond to the first seven of the eight bits of the matrix. By depressing these buttons, you will activate Bit 1-7 for each of the three groups of Channels.

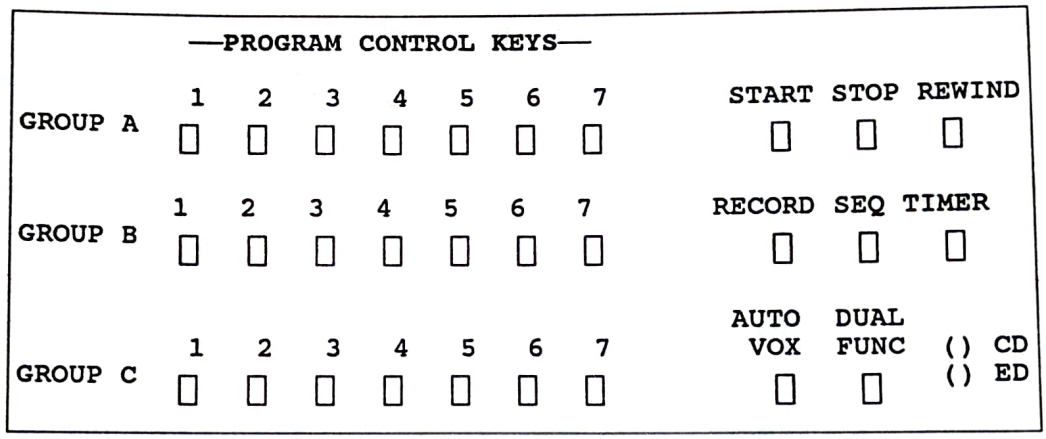

Figure II-3. ACS-50 Keyboard

Certain animated show functions always use the same channel and bit configuration. That is, tape recorder *STOP* is always *A-8*, *DUAL FUNCTION* is always *B-8*, and tape recorder *REWIND* is always *C-8*. Since the ACS 50 has separately designated buttons for these functions, the panel only contains seven *Program Control* keys.

PROGRAMMING THE SEQUENCER

The ACS has a built in *SEQUENCER*, allowing 30 seconds of programming for all three channels. It will repeat the pre-set sequence until the taped recorder is started either manually or by the timer or when the sequencer button is released. This feature gives the characters a life-like appearance between shows.

▪ PROGRAMMING STEPS

- ▸ Make sure the *TIMER* button is NOT depressed.
- ▸ Depress the *SEQ* button. The LED will illuminate.
- ▸ Depress the *RECORD* button to put the ACS into the record mode.

You are now ready to program. Depress the *Program Control Keys* in the order you want the character to move. The keys can be activated individually or at the same time in any order.

You may continue to program additional information into the program indefinitely. None of the information programmed into the SEQUENCER is erased, even if you continue beyond the 30- second repeat cycle. Thus, you can add more control information on each pass of the cycle.

To erase the sequencer memory, depress the **STOP** button while the ACS is in the sequencer programming mode. This will clear ALL information in the sequencer.

The sequencer program can be added to at any time by placing the ACS into the programming mode as set forth above.

The program placed in the sequencer will remain in ACS memory until the memory is cleared or ACS power is lost or turned off.

▪ SAVING SEQUENCER INFORMATION

The information in the SEQUENCER is in the ACS memory and will remain there unless power is turned off or electrical power is lost. When this happens, the information in the sequencer must be reprogrammed unless you have saved the information onto tape.

To save the information in the sequencer, place the ACS into the proper mode by depressing the *SEQ* button and the *RECORD* button as outlined in *Programming the Sequencer* above.

Insert a tape (not a prerecorded master tape because it will be erased) into the tape recorder and place the recorder into *record*.

Release the *SEQ* button on the ACS-50. The information in the sequencer will be recorded onto the tape in less than one second.

To retrieve the information from the tape after a power failure or shutdown, place the ACS-50 into the playback mode (all buttons off) and play the tape containing the sequencer information. The information will be automatically loaded into the ACS memory. **CAUTION!!** Any information previously in the memory of the SEQUENCER will be erased.

RECORDING A PROGRAM ON TAPE

Before attempting to record a program on tape, become thoroughly familiar with procedures for live show operation and procedures for programming the sequencer. Second, review the tape recorder operations manual included with your animation package (located in the *Appendix* of this manual). In particular, become familiar with the section on how to record information on the tape.

You learned in previous sections of this manual that the ACS-50 can *decode* information from the tape recorder into usable output signals that control the animation and other elements of the show. You also learned that the ACS has the ability to *encode* information into the SEQUENCER, or for live operation.

The remaining element for programming onto tape is to utilize the *PLAYBACK* and *RECORD* modes of your tape recorder in conjunction with the decode and encode capabilities of the ACS-50, to produce a tape with programmed information.

Let's review the rear panel of the ACS in Figure II-4

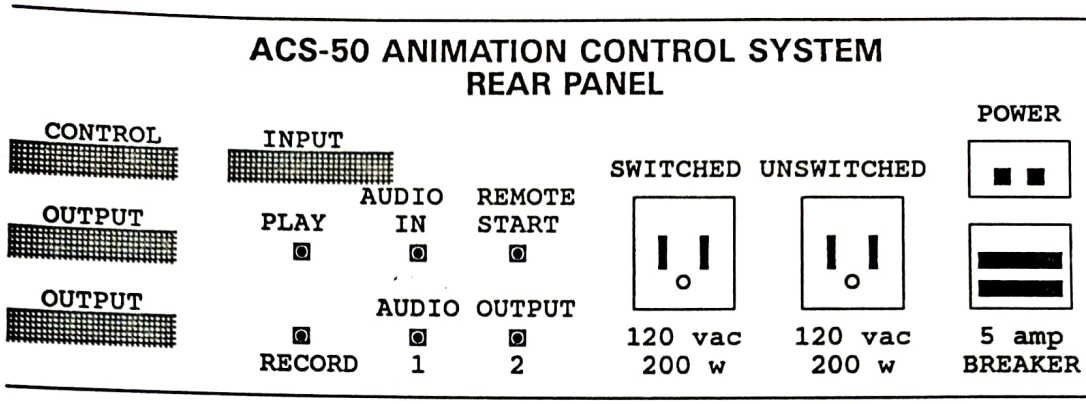

Figure II-4. Rear Panel of ACS-50

The ACS receives information from the tape recorder through the input connector labeled *PLAY* on the rear panel of the ACS-50. A phono patch cable should be attached from this *input* to the *output* of the tape recorder for the track containing the programmed data. Whenever the tape recorder is in the *playback* mode the ACS will receive and decode any information on the tape.

The ACS-50 sends information through the connector labeled *RECORD* on the rear panel of the ACS whenever the *RECORD* button on the front panel is activated. The output contains information being processed by the ACS from the keyboard.

By connecting the *output* from the ACS into the *input* of the tape recorder, the information can be recorded whenever the tape recorder is in the record mode.

A phono patch cable should be attached from *RECORD* connector of the ACS-50 to he INPUT of the tape recorder for the tape track that is to contain the coded data. When the tape recorder is put into *RECORD* mode, data output from the ACS-50 will be recorded onto the tape.

The first and most important step in programming and recording data onto tape is

MAKE SURE YOU ARE RECORDING ONTO A BLANK TRACK OF TAPE

Whenever a tape recorder is recording new information, any previously recorded information is erased. Always double check the cable connections from the ACS to the tape recorder to ensure that you will obtain the intended result.

MULTI-TRACK TAPE RECORDERS

Most tape recorders used with the ACS have at least three separately controlled tracks of tape. That is, each track of tape can be individually placed in either the record or playback mode. At least one of the tape tracks will be used for the audio portion of the tape(music, dialogue, etc.) and at least two of the tracks will be used for control information. Determine in advance which tracks you will use for audio and control information. For purposes of this manual, we will assume a four track recorder where tracks one and two are used for audio and tracks three and four are used for the control information.

The next step to making an animation control tape is to record the audio (music, dialogue, etc.) portion of the show onto the desired tape track. Refer to your tape recorder user's manual if you need assistance.

Make sure the audio tracks are in the PLAY mode and rewind the tape completely. Play the tape and adjust the audio system amplifiers and speakers to the desired levels. Rewind to the beginning of the tape.

▪ RECORDING A PROGRAM ON TAPE

Inspect the tape recorder connections and verify that the *RECORD* connector on the rear panel of the ACS-50 is attached to the *input* connector of *track 3* of the tape recorder.

Place *track 3* of the tape recorder in the record mode and start the tape.

Depress the *Program Control* keys that correspond to the bits of the desired movement or action. Continue programming until you reach the end of the audio portion of the tape. All information keyed in via the keyboard has been recorded onto the tape.

Disengaged the record function on track 3 and rewind the tape to the beginning. Verify that the *OUTPUT* connector of *track 3* is connected to the PLAY connector on the rear panel of the ACS, and play back the recorded information you have just entered. If the show does not duplicate the movements you programmed, verify your cable connections and tape recorder settings.

▪ ADDING MOVEMENTS

Once you have made a pass through the system, it is probable that you would like to add other movements to those you recorded. Because the ACS can simultaneously decode and encode, this can be accomplished by playing back the data recorded on track 3, adding new data via the keyboard, and recording the combined data on track 4.

The first step is to put the ACS into the *EDIT*. To place the ACS-50 in the *EDIT*, turn off the ACS power for a few seconds. Depress and hold the *RECORD* button while turning on the ACS power. This procedure tells the ACS you want it to decode information from tape while programming additional information from the keyboard, and output the combined information.

Check the connections on the rear panel and verify that the *OUTPUT* connector from *track 3* of the tape recorder is connected to the *PLAY* connector on the ACS-50. In addition, the *RECORD* connector on the back of the ACS should be connected to the *INPUT* connection for track 4 of the tape recorder.

Make sure that only track 4 is in the record mode and start the tape. Depress the *Program Control* keys corresponding to the bits of the desired movement or action. Continue programming until you reach the end of the audio.

Disengage *Record* mode on the tape recorder and rewind the tape.

The information on track 3 of the tape, combined with the information added via the keyboard was decoded by the ACS-50, and output onto track 4 of the tape recorder. Play back the data on track 4 by connecting the *output* of track 4 to the ACS *PLAY* connector.

If you desire to add more information to the tape, repeat the procedure by playing back the information from track 4 and recording the newly combined information onto track 3, and so forth. However, there are two things to remember.

1. **Always verify that the playback track contains good data before recording over a previous track.**
2. **Always double-check your cable connections before recording.**

INSTALLING THE SYSTEM

EQUIPMENT LOCATION

The location to the animated characters and associated control equipment to run your animatronic system are an important factors in achieving reliability and serviceability. If you have doubts about the location selected to house the characters or equipment, you should contact the Sally *Customer Service Department*.

▪ CHARACTERS

Animated characters should be kept out of direct sunlight and in generally dry environments.

Ultraviolet light may cause skin and costume fading as well as general material deterioration.

Moisture can also be damaging by creating mold and mildew, rust and corrosion.

Generally, characters should be anchored to the floor, stage or some other structure to stabilize the figure and provide a better performance.

▪ ELECTRONIC EQUIPMENT

The electronic equipment, e.g., ACS, audio source, amplifiers, etc. should also be kept out of direct sunlight and away from moisture and dampness.

Furthermore, such electronic equipment should be kept in relatively dust-free areas to avoid damage to switches, controls, relays, tape recorder playback and record heads, etc.

Cable lengths should generally not exceed 100-feet; the shorter, the better. Control and audio cables should be routed away from noise-producing sources such as motors, solenoids and high voltage switching circuits.

▪ AIR COMPRESSOR/DRYER

Air source equipment should also be kept in a relatively dry and dust-free area in order to reduce the amount of moisture produced during the compressor cycle and to avoid clogging delicate air valves with foreign matter.

Air lines should be tightly secured at their connectors and run on the most direct and shortest route. It is permissible for the air compressor equipment to be placed in a soundproof housing or away from the other equipment to reduce mechanical noise. However, air compressors need a well-ventilated area in which to function.

ELECTRIC POWER CONSIDERATIONS

Whenever possible the ACS and audio equipment should be isolated from electrical circuits which may have motor-driven equipment or electrical heavy surges. In other words, the ACS and audio equipment generally can share the same circuit, however, the air compressor should operate from a separate electrical circuit to reduce any possibility of interference by the electric surges created when the compressor motor is cycled on. It's also advisable that heavy stage lighting be delegated to a separate circuit.

CONTROL OUTPUTS

Because the ACS-2000 can control up to 128 channels, it therefore must have at least 128 signal wires and one common (B+) wire to operate the system. The rear panel of the ACS contains up to five output control connections, each connection containing 50 contact points. The *Appendix* of this manual shows which signal controls each specific movement or effect in your show. The output connections and the signals they control are listed in Table III-1 and the ACS-2000 back panel is depicted in Figure III-1

OUTPUT NUMBER	SIGNAL CONTROL
CONTROL	TAPE RECORDER CONTROL, MISC.
OUTPUT NUMBER 1	SIGNALS A1-A8, B1-B8, C1-C8, D1-D8
OUTPUT NUMBER 2	SIGNALS E1-E8, F1-F8, G1-G8, H1-H8
OUTPUT NUMBER 3	SIGNALS I1-I8, J1-J8, K1-K8, L1-L8
OUTPUT NUMBER 4	SIGNALS M1-M8, N1-N8, O1-O8, P1-P8

TABLE III-1. ACS-2000 Output Connector Assignments

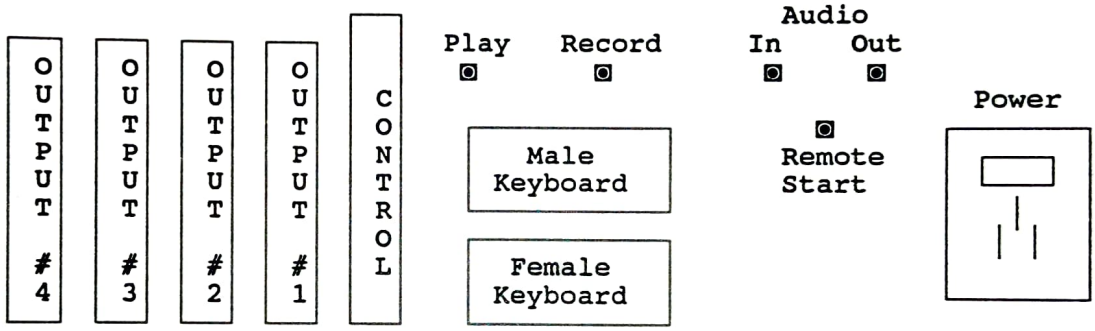

Figure III-1. ACS Rear Panel Layout

INSTALLING THE SYSTEM

Generally, the outputs from the ACS are connected directly to the characters or other controlled elements of the show. Your show equipment package includes cables designed to match these ACS connectors and provide control signals (and B+ - 24 vdc) to the show. Extension cables may be acquired through Sally, and probably locally, in the event more distance is needed between the ACS and show elements.

When the number of locations exceeds the four output connections (usually eight characters and four output connections), an interface panel is required. If your show has an interface panel, details will be provided in the *Appendix*.

▪ PLAY AND RECORD CONNECTORS

Your ACS decodes the information on the data channel of the audio tape. The input jack labeled *play* on the rear panel of the ACS is where the information is received by the ACS. This line should be plugged into the output of the audio source channel containing the programmed data.

To play a previously recorded program, the output from the data track on the tape deck should be plugged into the play connector on the back of the ACS.

Your ACS also has the capability to record, or input data onto tape.

WARNING: Do Not Record Onto Your Prerecorded Show Tape.

The output jack labeled *record* on the rear of the ACS, is where the new information is output to the tape recorder. A phono jack cable should be attached from this output to the input of the tape recorder for the track of tape that is to contain the coded data. When the tape recorder is put into the record mode, then the data input from the ACS will be recorded onto the tape.

▪ OTHER AUDIO CONNECTORS

The audio connectors are used in conjunction with the *AutoVox* feature of the ACS. The *AutoVox* feature causes the mouth of your character to move in synchronization with the audio during live operation.

Audio Input

The *audio input* connector on the back of the ACS supplies signal to the *AutoVox* circuit. It may be fed directly from the tape output or from the speaker output of the amplifier. One may work better than the other.

Audio Output

The *audio output* connector on the ACS back panel should be connected to the *input* of the audio amplifier which, in turn, is connected to the speakers. This connection only is used when the *AutoVox* feature is required, otherwise the audio source is connected directly to the amplifier.

Remote Start

The *remote start* input connector is for starting the system manually from a distant location. Functionally, the input is the same as the start button on the front panel of the ACS (see discussion on *tape control*). This connection can be used for any remote start mechanism including motion detectors, push buttons, etc.

Electrical Output-Switched

The rear panel also contains a standard female electrical receptacle that is only activated by the ACS. This output is rated at 120 v @ 200 watt or its non-U.S. equivalent.

Sally Industries, Inc.

ACS-2000 Series Operating Manual